

Electric Vehicle Technology (315335)

MSBTE Diploma · K-Scheme · Model Question Paper — Set A

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) List any four types of electric vehicles.
- b) State the goal of the EV30@30 campaign.
- c) Define the following terms of a battery: i) Specific energy ii) Energy density
- d) State any two needs of a Battery Management System (BMS) in an EV.
- e) Define battery swapping.
- f) Classify the electric drives used in electric vehicles based on the type of motor.
- g) State any two barriers to the adoption of electric mobility in India.

Q.2 Attempt any THREE of the following:**12**

- a) Compare an electric vehicle and an IC engine vehicle on the following points: i) Environmental impact ii) Power source iii) Maintenance iv) Running cost
- b) Draw and explain the block diagram of the subsystems of an electric vehicle.
- c) An electric scooter has to travel 90 km on a single charge. Its average energy consumption is 35 Wh/km. Assuming a battery pack efficiency of 85 % and a system voltage of 60 V, calculate the required battery capacity in kWh and in Ah.
- d) Describe the incentives provided for the installation of EV charging infrastructure under the Maharashtra Electric Vehicle Policy, 2021.

Q.3 Attempt any THREE of the following:**12**

- a) Explain the mechanical and electrical connections of the motor in an electric vehicle.
- b) Differentiate between a fuel cell and a battery. (Any four points)
- c) Explain the working principle of a Permanent Magnet Synchronous Motor (PMSM). State any two advantages.

- d) Compare AC charging and DC charging of EVs. (Any four points)

Q.4 Attempt any THREE of the following:

12

- a) Draw and explain the series hybrid electric vehicle configuration.
- b) Define: i) Self-discharge rate ii) Deep cycle iii) Specific power iv) Battery life
- c) An EV has a 40 kWh battery. It is charged from 25 % SOC to 90 % SOC using a 7.2 kW AC charger. Taking the charging efficiency as 90 %, calculate the charging time.
- d) State the meaning of V2X technology. Explain its significance in the smart grid with a neat diagram.
- e) Describe the role of scrappage incentives in promoting EV adoption. State the scrappage incentives given under the Maharashtra EV Policy, 2021.

Q.5 Attempt any TWO of the following:

12

- a) Explain the principle and working of a BLDC motor. Draw and explain the block diagram for torque control of a BLDC motor.
- b) Draw a neat labelled block diagram of a Battery Management System (BMS) and explain the function of each block.
- c) Compare brushed DC motor, induction motor, BLDC motor, PMSM and SRM used in EVs on the basis of: i) Power-to-weight ratio ii) Torque-speed characteristics iii) Cost of controller iv) Cost of motor

Q.6 Attempt any TWO of the following:

12

- a) Explain Level-1, Level-2 and Level-3 (DC fast) charging of EVs. State the connectors used for each.
- b) i) State the selection criteria of EV motors. ii) State the physical location of the motor in electric vehicles with examples.
- c) Explain the construction and working of a Li-ion battery with a neat diagram. State its advantages and disadvantages.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in